repulsive and attractive forces in general: "As in Algebra, where affirmative Quantities vanish and cease, there negative ones begin; so in Mechanicks, where Attraction ceases, there a repulsive Virtue ought to succeed" (Opticks, Query 31).

What disturbed many mechanists about Newton's approach was that he envisaged forces as operating over a distance, whereas the mechanical philosophy, especially as developed by Descartes, insisted on contact in any causal interaction. Newton himself, in the preface to *Principia*, tried to downplay this difference, referring to forces as mechanical principles:

> I wish we could derive the rest of the phenomena of Nature by the same kind of reasoning from mechanical principles, for I am induced by many reasons to suspect that they may all depend upon certain forces by which the particles of bodies, by some causes hitherto unknown, are each mutually impelled towards one another, and cohere in regular figures, or are repelled and recede from one another. These forces being unknown, philosophers have hitherto attempted the search of Nature in vain; but I hope the principles here laid down will afford some light either to this or some truer method of philosophy. (1687, Preface to the First Edition)

As Boas (1952) discussed in her classic history of the mechanical philosophy, two schools of Newtonians developed. One school accepted forces operating without contact while the other insisted on maintaining some version of mechanical contact as involved in all actions of forces:

> One, comprising those whom we call Newtonians today, accepted the concept of action at a distance; rejected mechanical explanations, denying their necessity; converted the ether into magnetic and electric fluids where necessary; and generally followed the theories enunciated in the *Principia* rather than the more speculative hypotheses of the *Opticks*. But there were other physicists of the eighteenth century who followed the more mechanical aspects of Newton's theory and used his ether to form a highly complex system. (Boas, pp. 519–20)

2. TWENTIETH-CENTURY CONCEPTIONS OF MECHANISM

The dominant twentieth-century philosophy of science, developed by philosophers and scientists who characterized themselves as *logical empiricists*, adopted a non-mechanical emphasis on explanation in terms of laws. Part of the reason for this was the logical empiricists' generally Humean, anti-metaphysical perspective, which rejected positing hidden causal relations between events. According to Hume, we observe sequences of events but do not observe anything connecting one event to the next. Hume favored a